



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of  
Inventor(s): PASINA

Appln. No. 10/806,317

Group Art Unit: 2833

Filed: March 23, 2004

Examiner: Unknown

Title: Method And Apparatus For Joining Ends  
Of Wires And The Like

Dkt. 62-333

Date: June 10, 2004

**SUBMISSION OF PRIORITY CLAIM AND  
PRIORITY DOCUMENT IN ACCORDANCE  
WITH THE REQUIREMENTS OF RULE 55**

Commissioner for Patents  
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Sir:

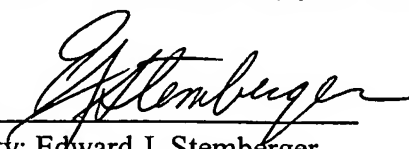
It is respectfully requested that under the provisions of 35 U.S.C. 119/365 this application be given the benefit of the foreign filing date of the following, a certified copy of which is submitted herewith:

<u>Application No.</u>	<u>Country of Origin</u>	<u>Filed</u>
2,424,594	Canada	April 4, 2003

Respectfully submitted,

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attached hereto and identified below are  
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Specification and Drawings, as originally filed, with Application for Patent Serial No:  
2,424,594, on April 4, 2003, by CIRO PASINI, for "Méthod and Apparatus for Joining  
Ends of Wires and The Like".

*Gray Bulthuis*  
Agent certificateur/Certifying Officer

March 5, 2004

Date

Canada

(CIPO 68)  
04-09-02

OPIC  CIPO



ABSTRACT OF THE DISCLOSURE

A method of joining the ends of cables, each comprising a plurality of conductor strands, said method comprising

5 (g) providing each of said ends with an enlarged terminal portion of greater diameter than said cable adjacent said end

(h) inserting said ends into a connecting tube having an outer layer of an explosive charge, and

10 detonating the explosive layer so as to compress the connecting tube around the conductor strands. The method offers a cheaper, faster and simpler method of joining a bundle of wires and the like than prior art methods.



**METHOD AND APPARATUS FOR JOINING**  
**ENDS OF WIRES AND THE LIKE**

5

**FIELD OF THE INVENTION**

The present invention relates to a method for joining wires, rods, cables, high tension lines and the like and for attaching an end fastener thereto, by means of an explosive charge; to said fastener for use in said method, and to a joined wire fastener combination when made by said process.

**BACKGROUND OF THE INVENTION**

In connection with heavy gauge wires, which may be disposed in positions which are difficult to reach, commensurately high powered tools are required to make pressure connections between said wires. In view of the weight and bulk of the tools it may be inconvenient or impossible to carry such tools to the sites at which the joining is to be made.

It has previously been proposed to connect ends of wires and the like by inserting the ends into a corresponding bore of a connecting member provided with an external layer of explosive, which during detonation, compresses the connecting member around the ends. The layer of explosive used had, however, an even cross-section along the whole length thereof in order to produce an even radial compression of the connecting member.

In connection with high tension lines, supporting cables and the like, which are subjected to heavy stresses, it is of great importance to obtain a permanent, tight clamping effect of the connecting member to ensure that no relative sliding movement may occur between the member and the ends connected thereby.

Thus, such connectors, herein termed implosive connectors, have been used in high energy metalworking to replace conventional hydraulic compression fittings for high voltage transmission lines. A small charge, engineered for each connector, supplies the energy to complete the installation in 1/10,000 of a second, replacing the work of a 60 to 100 ton press. Such implosive connectors are completely metallic fitting and result in a void free, uniformly smooth and straight connector.

In more detail, generally, implosive connectors comprise a conductor splice consisting of an outer aluminum sleeve equipped with a pre-mounted implosive charge, and preferably, optionally, an inner steel sleeve having an aluminum tube on the outside.

However, there remains a need to find a method to join ends of wires and the like  
 5 which are cheaper, quicker and easier to install while providing at least an acceptable efficacious permanent join of the wires.

### SUMMARY OF THE INVENTION

10 It is an object of the present invention to provide a method of joining ends of wires and the like which is cheaper, faster and easier to effect than prior art methods and apparatus.

It is a further object to provide a connector for joining ends of wires and the like of use in the aforesaid method.

Accordingly, the invention provides in one aspect, a method of joining the ends of  
 15 wire cables, each comprising a plurality of conductor strands, said method comprising

- (a) providing each of said ends with an enlarged terminal portion of greater diameter than said cable adjacent said end,
- (b) inserting said ends into a connecting tube having an outer layer of an explosive charge, and
- 20 (c) detonating the explosive layer so as to compress the connecting tube around the conductor strands.

Preferably, the method as hereinabove defined comprises providing each of said ends with a terminal enlarging member longitudinally of said cable through said terminal portion to effect said enlargement.

25 The enlarging member is most preferably a metal, e.g. a steel rod insert, and, most preferably, having a head such as to constitute a stud or the like.

The terminal portions so abut each other within the connector as to provide a resultant good join after the detonation. It can be appreciated that use of a pair of aforesaid flat-headed inserts can enhance the stability and conductivity of such a resultant join.

30 It can be readily seen that by increasing the terminal extremity diameter of the cable relative to the cable adjacent the terminal portions, according to the invention, by means of the inserts, results in the cables having a larger diameter than the rest of the conductor inside the sleeve of the connector. Thus, the conductor is so anchored within the sleeve that it cannot disadvantageously slip or be displaced.

In a most preferred method, the invention provides use of a connector wherein the explosive layer comprises a first portion of explosive and a second portion of explosive, separated therefrom by an intervening interportion distance, wherein each of the first and second portions is of greater thickness than at interportion distance, and wherein the first and second portions are disposed on the outside surface of the connecting tube such that the interportion surrounds each of the enlarged terminal portions of the ends of the cables; and the first and second portions surround the respective cables adjacent the ends, prior to detonation, as to effect a greater explosive compaction force onto the cables adjacent the ends relative to the forces exerted on the terminal portions.

Thus, in a further feature, the invention provides a connector as hereinabove defined of use in the methods as hereinabove defined.

In a still further aspect, the invention provides a joined cable assembly comprising a connecting tube and cable resulting from a method as hereinabove defined.

#### BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be better understood, preferred embodiments will now be described by way of example only with reference to the accompanying drawings wherein Figs. 1A – 1H represent diagrammatic sketches of the components and preparatory steps practiced in a general method of explosively joining wire ends with a connector, according to the prior art.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

With reference to Figs. 1A and 1B, a conductor splice consists of (a) an outer aluminum cylindrical sleeve (10) having a pre-mounted implosive charge layer (12) coiled around the outer surface (16) of connector (10). Layer (12) is of uniform thickness essentially the length of surface (16) except at a thicker central portion (18) (Fig. 1A); and (b) an inner steel sleeve (20) having an aluminum filter tube (not shown) on the outside (Fig. 1B).

Operational guidance as given to operators in the field follows with reference to Figs. 1C – 1H.

1. Cut the conductors (22) as cleanly as possible and minimize burring or bending the steel strands (24). Cut the aluminum strands (26) at a distance of half the

length of the inner steel sleeve (20) less 0.1 in. (2 – 3mm). Rewind any loose steel strands and bind securely with wire. (Fig. 1C).

2. Mark each end of the conductors (22) at a distance of half the length of the outer aluminum sleeve (10) less 0.1 (2 – 3 mm). (Fig. 1D).
3. Slide the combined charge and aluminum sleeve (10) onto one of the conductor (22) ends. (Fig. 1E).
4. Insert steel sleeve (20) into the core of conductor (22) and remove the binding wire. Repeat with the other conductor (22) end and push both conductors (22) until the aluminum strands (26) meet the inner steel sleeve (20). (Fig. 1F).
5. Slide the combined charge and aluminum sleeve (10) until each end of the sleeve corresponds with the marks previously made. (Fig. 1G).
6. Mount the assembly and tape the detonator securely at the indicated position on the implosive sleeve (Fig. 1H). Before initiation, ensure that outside aluminum sleeve (10) is correctly positioned with conductors (22). (Fig. 1H).
7. Effect initiation and detonation.

With reference to Figs. 2A – 2E, the conductor splice of use in the present invention consists of an outer aluminum sleeve (100) shown in Fig. 2A equipped with a pre-mounted implosive charge (102), wherein the amount of implosive charge is approx. 20 – 25% less than the aforesaid prior art embodiment of Fig. 1A and a pair of studs (104) steel insert (Fig. 2B).

In instructional format, the operational steps are as follows:

Cut the conductors (22) as cleanly as possible. Push steel stud (104) through the center of conductor (22) at the end thereof until the aluminum head of stud (104) rests against the conductor (Figs. 2C and 2D) and to provide an enlarged terminal portion (106).

Insert both conductors (22) inside the implosive aluminum sleeve (100), one on each side, until they abut at the center of sleeve (100) (Fig. 2E).

Main sleeve (100) has a layer of explosive cord (102) of essentially uniform thickness along the length of sleeve (100), except at a first portion (108) and a second portion (110) displaced from the middle of sleeve (100) as to provide an intervening interportion distance (112) which interportion layer of explosive surrounds each of the enlarged terminal portions (106). Each of first and second explosive layers at portions (108) and (110) has a greater thickness than at said interportion distance, and wherein said first and

second portions are disposed on the outside surface of said connecting tube such that said interportion surrounds each of said enlarged terminal portions of said ends of said cables and said first and second portion surround said cables adjacent said ends, prior to said detonation, as to effect a greater explosive compaction force onto said cables adjacent said ends relative to the forces exerted on said terminal portions.

The explosive is initiated as an implosive charge as for prior art embodiment.

Fig. 3 is a diagrammatic longitudinal cross-section of a resultant join according to a method and components according to the invention.

It can, thus, be readily seen that most advantageously to only a single connector, sleeve or the like need be used to provide a most efficacious join, in a faster and cheaper manner than the prior art methods, while providing a non-slip product.

Although this disclosure has described and illustrated certain preferred embodiments of the invention, it is to be understood that the invention is not restricted to those particular embodiments. Rather, the invention includes all embodiments which are functional or mechanical equivalents of the specific embodiments and features that have been described and illustrated.

Claims

1. A method of joining the ends of cables, each comprising a plurality of conductor strands, said method comprising
  - (d) providing each of said ends with an enlarged terminal portion of greater diameter than said cable adjacent said end
  - (e) inserting said ends into a connecting tube having an outer layer of an explosive charge, and
  - (f) detonating the explosive layer so as to compress the connecting tube around the conductor strands.
2. A method as defined in claim 1 comprising providing said ends with a terminal enlarging member longitudinally of said cable through said terminal portion to effect said enlargement.
3. A method as defined in claim 2 wherein said enlarging member is a metal rod.
4. A method as defined in claim 3 wherein said metal rod has a flat head.
5. A method as defined in claim 4 wherein said flat heads abut one to another within said connecting tube prior to said detonation.
6. A method as defined in any one of claims 1 to 5 wherein said explosive layer comprising a first portion of explosive and a second portion of explosive separated therefrom by an intervening interportion distance, wherein each of said first and second portions has a greater thickness than at said interportion distance, and wherein said first and second portions are disposed on the outside surface of said connecting tube such that said interportion surrounds each of said enlarged terminal portions of said ends of said cables and said first and second portion surround said cables adjacent said ends, prior to said detonation, as to effect a greater explosive compaction force onto said cables adjacent said ends relative to the forces exerted on said terminal portions.
7. A connector comprising a connecting tube and a layer of explosive as defined in claim 7.
8. A joined cable assembly comprising a connecting tube and a joined cable when produced by a method as defined in any one of claims 1 to 6.

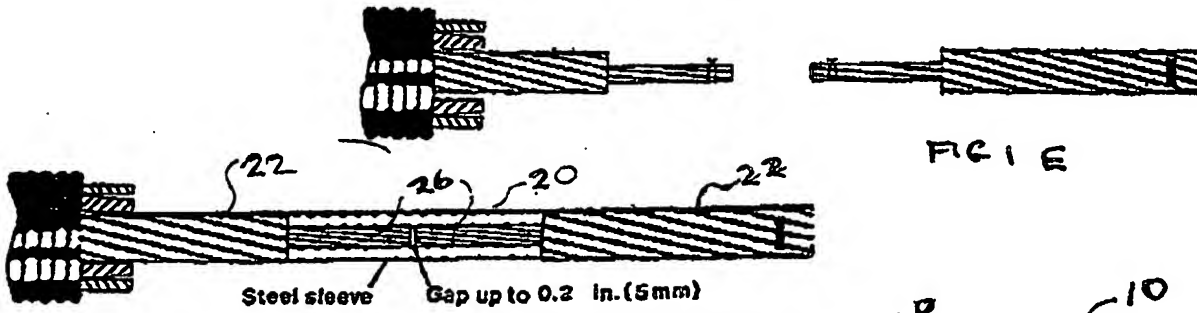
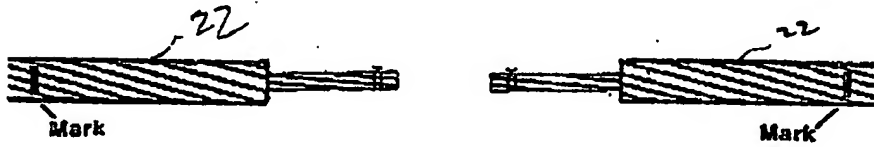
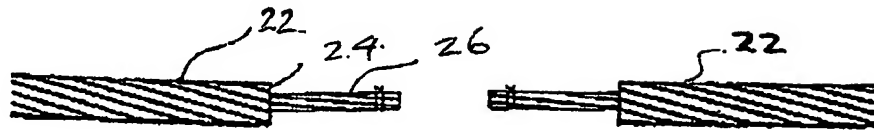
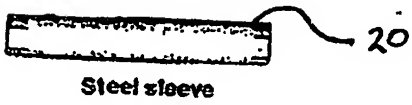
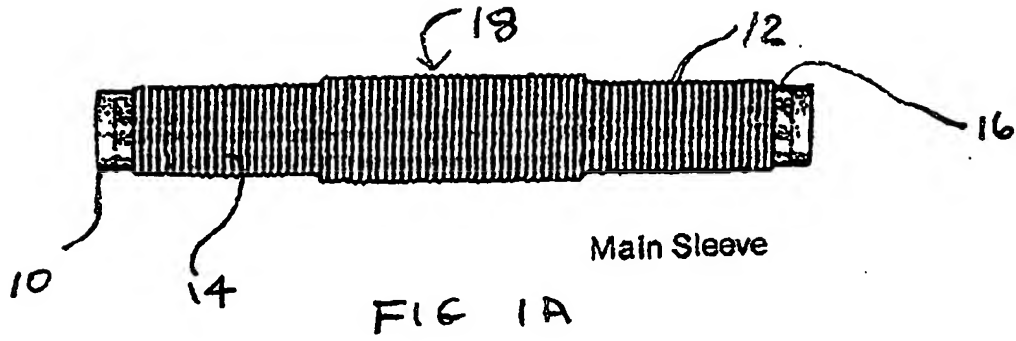
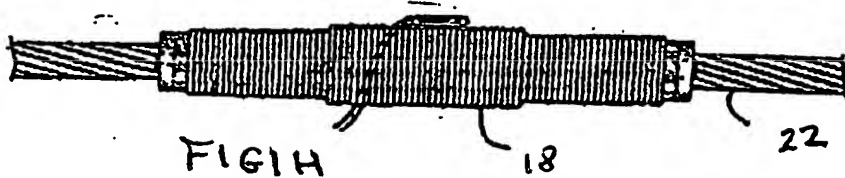
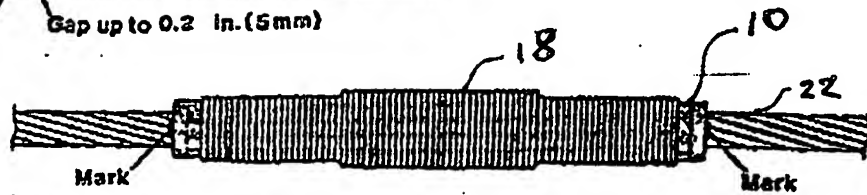


FIG 1F



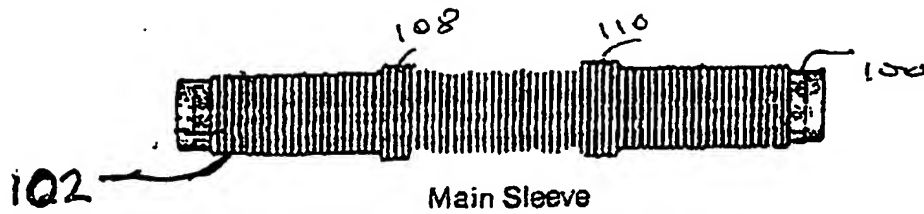


FIG 2A

FIG 2B

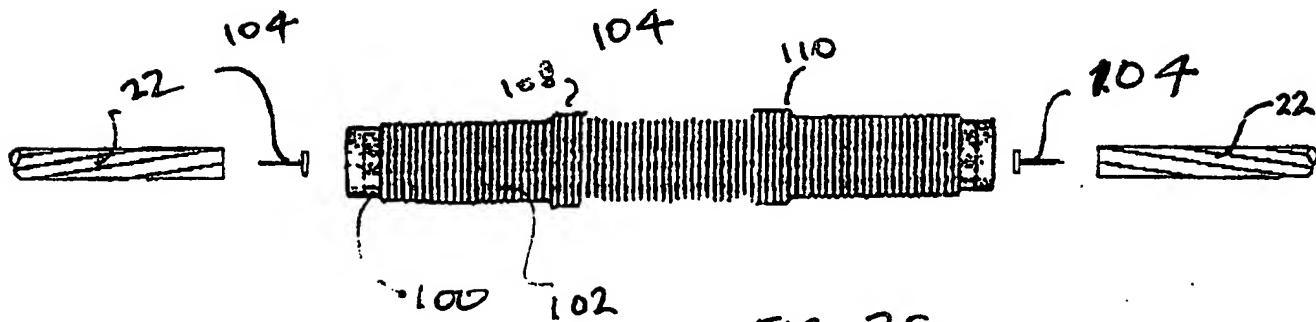


FIG 2C

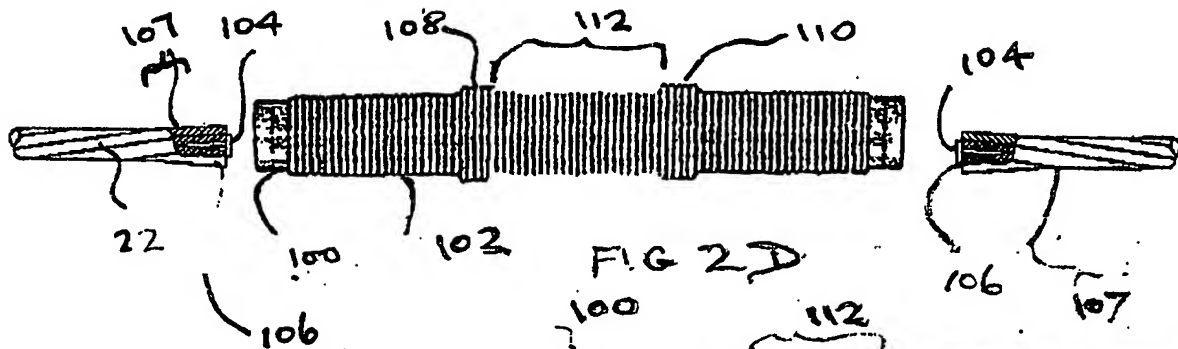


FIG 2D

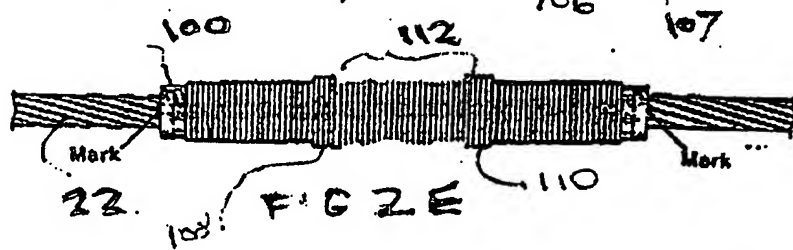


FIG 2E

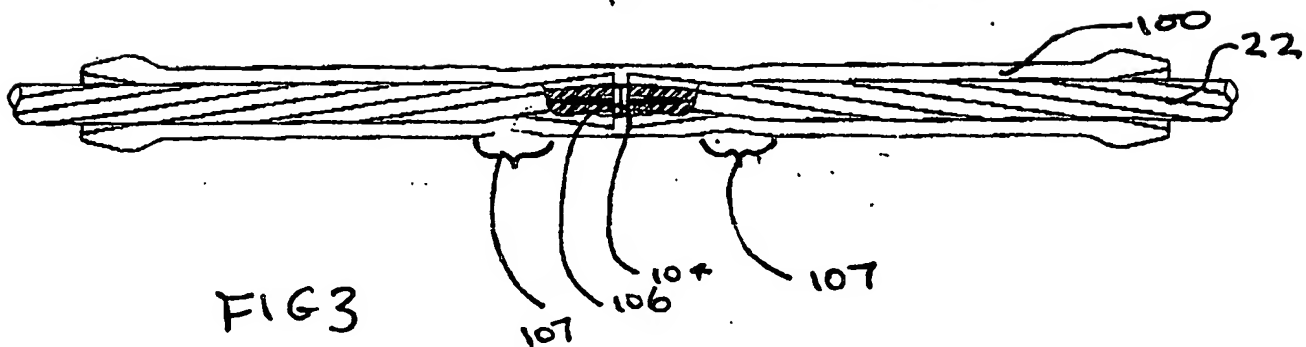


FIG 3